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Integrated Pest Management

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Introduction

In March 1996, the U.S. Environmental Protection Agency and the U.S. Department of Defense (DoD) agreed in a Memorandum of Understanding to reduce human exposure to pesticides and to reduce environmental impacts caused by pesticide usage. The Food Quality Protection Act of 1996 (Section 303) requires all Federal agencies to have Integrated Pest Management (IPM) programs. The DoD is committed to fully implement IPM as a tool to achieve a 50% reduction in pesticide use at DoD installations by the year 2000, compared to baseline pesticide use in Fiscal Year 1993. However, the Air Force has accelerated their target dates to reach the Department of Defense (DoD) Goals to 30 September 1997. The original goals, established in December 1993, include:

1. Have current pest management plans at 100% of installations by the end of Fiscal Year (FY) 1997;
2. Reduce the amount of pesticide active ingredient applied at installations by 50% by FY 2000; and
3. Have 100% pesticide applicators certified by the end of FY 1998.

According to a 15 April 1997 HQ USAF/ILE Memorandum, "Air Force Pest Management Initiative," installation's aggressive pest management programs have placed the Air Force within a few percentage points of obtaining each goal. The memorandum also states the Air Force is in excellent position to achieve all goals by the end of FY 97 and continued efforts to meet the revised target date will advance implementation of IPM and result in more effective pest control and reduction of pesticide use.

What is IPM?

IPM combines biological, chemical, cultural, and physical control practices into one program to manage pest populations. The goal of IPM is to reduce the use of pesticides that may present a hazard to humans and the environment. Whereas traditional pest control methods rely on indiscriminate, often unnecessary use of pesticides, IPM utilizes routine monitoring to ascertain whether pest control measures are necessary. In situations where levels of economic, medical or aesthetic damage are regarded as unacceptable or where safety is threatened, various IPM practices are evaluated to determine which treatment or combination of treatments will be most effective and least disruptive to the environment.

IPM Methods

A suite of IPM methods is available that can be used on an individual basis or in combination, depending on the best overall method of pest control for the specific pest problem. IPM methods include sanitation, modification of the pest's habitat (food and water), exclusion, regular inspection, trapping, biological management (i.e. plant pathogens,

beneficial insects or pheromones), good fertilization, mowing, and aeration practices, the use of native and weed-resistant plants, and, when necessary, the use of chemicals with low toxicity. In selecting IPM methods, preference should be given to practices that minimize or eliminate the need for chemical applications. Education of the public and pesticide applicators about the various IPM methods available, and the importance of increased tolerance of pests in certain situations, is another valuable tool.

Depending upon the particular pest problem, certain situations may warrant continued use of pesticides at lower usage rates. In other situations, implementation of two or more IPM practices may afford the most effective control. Criteria that are considered in selecting the most appropriate IPM methods are cost, effectiveness, environmental impact, toxicity, regulatory concerns, and acceptability.

Target Areas for IPM Practices

Many settings within DoD installations have problems with insects, weeds, fungus or rodents. Areas in and around base buildings and military family housing, such as billeting and permanent party bachelor quarters, experience a variety of pest problems. Other settings with significant pest problems include highly developed, high maintenance areas such as lawns, parade grounds, and golf courses; low maintenance areas or areas intentionally devoid of vegetation, such as cracks in pavement, fence lines, rights-of-way, parking lots, and electric substations; and aquatic environments such as ditch banks, ponds or streams. Each situation presents a unique combination of problems and considerations. Therefore, IPM strategies must be tailored for each situation, depending upon the specific requirements for that location.

Categories of Pest Management Practices

The selection of IPM pest management practices will differ according to the particular pest and its environment. These practices include alternatives to herbicide, insecticide, fungicide, and rodenticide use.

IPM Implementation

Herbicides

Herbicides include any chemical used to kill or inhibit the growth of vegetation. They can be used to target a particular plant species or to destroy all vegetation. Herbicides are the most commonly used pesticides on Air Force bases.

Currently at DoD installations, non-selective herbicides are used to kill all vegetation in areas of low maintenance. Multiple IPM alternatives for bare ground control and fence line weed control are available.

- Cracks in pavement can be filled to prevent weed growth;
- Hand weeding and mechanical trimming can be substituted for chemical control;
- Weeds in large industrial areas can be removed via scraping, disking or dragging; and
- Small areas can be flamed or steamed. (These relatively new treatments utilize heat or hot water in the form of steam or fire (propane torch flames), and do not involve the use of chemicals.)

Although the above alternative treatments are limited in that they often do not kill vegetation with deep taproots, they can be useful if frequent treatments are made or if they are used in conjunction with other IPM practices.

A new product, the Weed Seeker sprayer, detects chlorophyll by spectral reflectance and helps target the herbicide application to the plant. Tests on plots have shown that the Weed Seeker sprayer, when used in conjunction with a herbicide application program, can reduce the amount of herbicide needed in areas where scattered weed infestations are a problem, such as parking lot cracks.

Other effective IPM measures that can be used to control unwanted vegetation include reducing the area that must be treated and applying herbicides with low percentages of active ingredient.

Aerial application of herbicides is common at Air Force bases where large areas such as target ranges must be treated to maintain visibility. Depending on the location, feasible IPM alternatives may be to mechanically remove the vegetation and/or to apply herbicides with low percentages of active ingredient via aerial or ground applications.

Turf weed management refers to weed control and grounds maintenance activities. IPM programs offer a number of alternatives to herbicide use in the control of turf weeds. A number of IPM approaches focus on regular maintenance activities to keep turf healthy, such as improving fertilization, irrigation, and aeration practices, manual

weed removal, and spot treatment of weeds. In addition, turf in some areas can be replaced with alternative natural vegetation and other ground covers such as mulch or rock, reducing the amount of pesticide applications that would otherwise be made. Other IPM practices include treating only those areas that are considered necessary, and as a last resort, applying a herbicide with a low percentage of active ingredient. When herbicide treatments are deemed necessary, applications should be made only when the weeds are not stressed, since weeds go into dormancy during times of stress (such as drought and freezing conditions), rendering the herbicides less effective. Promoting tolerance of weeds in some turf areas will help minimize the need for pesticide applications. It is important to note that many bases have terminated or reduced herbicide use on turf areas.

Aquatic weeds can be controlled by stocking ponds, lakes or other bodies of water with grass carp (legal in 37 states) that graze on vegetation, or by limiting weed growth by reducing nutrients. While grass carp will not reproduce in lakes and ponds, their use must be carefully planned to ensure the appropriate number are released and food sources for other fish are not depleted. Vegetative growth can be limited by directing nutrient-laden runoff away from water retention ponds. Other IPM methods that can limit aquatic growth include using slow-release nitrogen sources and controlling plant nutrient applications (i.e. fertilizers) upgradient of water sources. Also, vegetation along ditch banks can be cut back by physical means such as a tilt mower.

Insecticides

Insecticides are substances that kill or interfere with the life cycle of insects in such a way as to reduce insect numbers. Insecticides may be used to treat indoor and outdoor areas at Air Force bases. IPM practices focus on the biology of the insect, and may involve elimination of habitats favored by insect pests.

Biological means of insect control include using plant foods that repel insects on ornamentals, replacing ornamentals with other varieties that are less attractive to pests, and encouraging greater numbers of natural predators such as birds and bats by installing bird and bat houses in outdoor areas where flying insects are a problem (away from flightline areas). Mechanical removal of insects from plants or fall webworm nests from trees may be effective measures of control in small areas of infestation. Insect pests such as ants, bees, wasps, mole crickets, cutworms, and Japanese beetles can be controlled using applications of chemicals with low percentages of active ingredient and/or low application rates.

Other suggested IPM strategies are specific to the particular insect pest. For example, ants can be controlled with baits or by pouring boiling water on ant mounds. Spraying a dishwashing soap and water mixture using a hand-held sprayer can eliminate bees, wasps or hornets. Other alternatives for bee control include using synthetic pyrethroids, calling a local bee keeper to remove the hives, and using traps. Releasing microscopic, parasitic worms can control mole crickets, cutworms, and Japanese beetles. The tachinid fly is parasitic to mole crickets and thus, is an effective non-chemical means of eliminating these insect pests. Japanese beetle infestations can be controlled by removing the preferred food source, manually removing the beetles, applying the organic oil Neem, and spreading milky spore bacteria on soil which is toxic to Japanese beetle larvae. Scale insects can be controlled with dormant oil when applied at the correct developmental stage of the insect's life.

Common indoor insect pests are ants, cockroaches, termites, and fleas. Cracks and crevices in structures should be sealed to prevent entry of these pests and other insects. Insect growth regulators are successful in controlling cockroaches, termites, and fleas. For ant control, the methods described for outdoor problems can likewise be applied to indoor infestations. For cockroach control, IPM strategies may involve the use of gel bait insecticides, cockroach bait stations, and/or thermal control. Non-chemical means of controlling cockroaches include removal of food and water sources and hiding places (harborages), in conjunction with exclusion practices such as caulking cracks and gaps around doors and windows. Flea infestations can be eradicated by applying insecticides with low percentages of active ingredient.

Mosquitoes can be controlled using various measures. For example, eliminating standing water will prevent the development of mosquito larvae. Another method is to apply the bacterium Bacillus thuringiensis in a liquid or granular form with conventional sprayers or spreaders; the bacterium acts as a deadly stomach poison to mosquito larvae. Mosquito fish stocked in man-made, closed bodies of water can control mosquito populations. Insect growth regulators and periodic application of synthetic pyrethroids in a ground application when a mosquito problem is suspected, are other IPM alternatives. Many bases have reduced the practice of fogging, relying instead on biological means of mosquito control.

Fungicides

Fungicides are substances that destroy or inhibit the growth of fungi. Golf courses on Air Force bases may exhibit fungus problems. As alternatives to repeated fungicide applications, IPM strategies involve improving turf health and

disease resistance through fertilization, aeration, irrigation, and increased mowing height. If biological control methods prove unsuccessful, laboratory analysis of soil samples at the site can identify the specific type of fungus present, so that the most effective fungicide is selected to target a specific fungus problem. In addition, the local extension service can suggest disease-resistant ground covers and native vegetation best suited for the area.

Rodent Control Methods

Rodenticides are poisons that are used to kill rodents. Although rodenticide applications comprise a relatively small percentage of pesticide usage on Air Force bases, implementation of IPM methods is safer from a public and environmental standpoint. Use of rodenticides can cause accidental or secondary poisoning of non-target species or can result in odor problems from poisoned animals that died in inaccessible places. IPM strategies integrate knowledge of rodent ecology with various nontoxic measures to provide the best strategies for rodent removal from a particular setting. Sanitation and exclusion are highly effective preventative measures, since elimination of food, water, and/or cover can force rodents to vacate the premises. The use of live traps as an IPM strategy of rodent control in another nontoxic, environmentally safe strategy. Rodents caught in live traps can be relocated to wooded areas. Local extension agents can suggest additional information on IPM alternatives for rodent control that address each problem on a case-by-case basis.

IPM and Air Force Success Stories

Sheppard AFB, Texas

The release of lady bugs to biologically control aphid, scale, mealybug, and spider mite infestations on the base has been highly successful. As a result, Mr. Jimmy Lindsey and his staff do not need to apply pesticides in certain problem areas. Predacious-type insects such as lady bugs decimate resident insect pest infestations, thereby providing a biologically safe alternative to insecticide applications on the base.

Laughlin AFB, Texas

The release of predacious wasps that feed on webworms was an economic success story, thanks to Mr. Ralph Mitchell, with assistance from AETC pest management professional Carl Lahser. Because of their efforts, contract funds were saved and insecticide applications were not needed.

Shaw AFB, South Carolina

The bacterial strain, Bacillus thuringiensus, was an effective biological control agent that eliminated mosquito larvae, thanks to the efforts of SSgt. Tim Clepper. As a result, the need for chemical control of mosquitos has been greatly reduced.

Bolling AFB, D.C.

Education has proved to be an important IPM tool at Bolling AFB. Through the efforts of Mr. Charles White, an IPM self-help program available to installation residents has resulted in reduced numbers of service order calls.

Tyndall AFB, Florida

Good sanitation measures combined with smaller amounts of baits have allowed Mr. Oscar Hickman to use smaller quantities of pesticides at food facilities.

Luke AFB, Arizona

By applying pre-emergent herbicides, TSgt. Raymond Hess has reduced chemical usage and associated labor costs, as was the case of continuous contact herbicide spraying in past years. Pre-emergent herbicides provide longer periods of control needed for successful vegetation management.

References

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of the Air Force Material Command.

Wayne Fordham. "Pest Management - A new approach". Published in The CE Magazine, Winter 1995.

University of Florida, Institute of Food and Agricultural Sciences. "Cockroach Management Without Insecticides", undated.

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HQ USAF/ILE Memorandum, "Air Force Pest Management Initiative," 15 April 1997.

Acknowledgement

PRO-ACT wishes to thank Mr. Wayne Fordham, Pest and Grounds Management, Headquarters Air Force Civil Engineer Support Agency (AFCESA), DSN 523-6465, for his technical assistance in developing and reviewing this fact sheet.

Sources of Additional Information

The Air Force has previously provided the following textbooks to all pest management shops:

Leslie, Anne R. Handbook of Integrated Pest Management for Turf and Ornamentals. CRC Press, Inc., 1994.

Olkowski, William, et. al., Common-Sense Pest Control. The Taunton Press, 1992.

Environmental personnel can contact their pesticide shop foreman to review these publications.

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